# THE CONTROL OF EPIDEMIC TYPHUS

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Control phases of epidemic typhus have advanced enormously during the past decade. Prior to World War II this disease was one of the most dreaded, especially during war time and post war periods of readjustment of the population. The disease is caused by *Rickettsia prowazeki* and is transmitted by the human body louse *Pediculus humanus* De G.

At the outbreak of World War II the Medical Department of the United States Army was anxious to develop a method of delousing which would replace the cumbersome method of treating clothing by steam. Fumigation with Methyl Bromide in gas tight chambers, and rubber bags was the first step toward replacing steam.

Although Methyl Bromide was a definite improvement over steam it had disadvantages. It was a cumbersome method but was employed at most of the Eastern ports for treating the clothing of German and Italian prisoners of war. The author, who was stationed at The Surgeon General's Office, was responsible for the technical supervision and procedure for delousing these prisoners.

During the early part of the war, MYL and DDT powders were developed. These offered great advantages over either steam or Methyl Bromide. The record of typhus control at Naples, Italy by MYL and DDT during the war and by DDT in some of the large epidemics in Japan following the war is now history. The author was connected with the USA Typhus Commission in Japan and in addition to setting up disinfestation at many ports, took an active part in combating some of the larger epidemics, especially at Osaka.

During the author's stay at the various ports in Japan over 2,000,000 Japanese, Koreans, Formosans, Chinese and other asiatics were dusted with DDT. The baggage of these individuals was also dusted at the same time. During the Osaka epidemic, approximately 1,400,000 Japanese subjects were dusted in 4 days. These examples fully justify all the efforts expended in research

toward the development of chemical powders for the control of lice.

While serving as liaison for The Surgeon General's Office to the U.S. Department of Agriculture at Orlando, Florida, the author personally conducted research which may lead to improvements on the standard DDT louse powder. The results of this research were used in a thesis presented to the Graduate School of Cornell University in partial fulfilment of the requirement for the PhD degree in Medical Entomology and Parasitology. The following remarks and data have been extracted from that thesis. The data indicate the relative toxicity of 106 compounds which were selected as the most toxic of over 10,000 subjected to screening tests.

In the beaker tests the 106 compounds which had been found to be 100 percent effective on adult lice for 31 days or more at 10,000 parts per million were further diluted and the better chemicals were again tested at still lower concentrations. Only 13 chemicals were found to be worthy of further study.

By dilution methods, DDT was shown to be inferior to the other twelve promising chemicals at a concentration of 100 p.p.m., and at 50 p.p.m. DDT was inferior to eight chemicals. Three chemicals; heptachlor, aldrin and dieldrin were more outstanding than DDT, all giving 100 percent kill at concentrations of 6.25 p.p.m. Aldrin gave 100 percent kill at concentrations of 3.125 p.p.m.

For comparison of these three chemicals with DDT the average percent mortality of lice is extracted from table 4 of the above mentioned thesis, as follows:

| Chemical | Concentration, parts per million | | | | | |
|---|---|---|---|---|---|---|
| | 100 | 50 | 25 | 12.5 | 6.25 | 3.125 |
| Aldrin | 100 | 100 | 100 | 100 | 100 | 100 |
| Heptachlor | 100 | 100 | 100 | 100 | 100 | 100 |
| Dieldrin | 100 | 100 | 100 | 100 | 100 | 100 |
| DDT | 88 | 63 | 15 | 3 | 5 | 0 |

Durability tests were made with all chemicals at concentrations of 10,000 parts per million. Durability tests with thirteen

of the more promising materials were made at concentrations of 50, 25, 12.5, 6.25, and 3.125 p.p.m. At concentrations of 50 p.p.m., DDT gave a 50 percent kill for one day and none thereafter. The remaining twelve at this concentration were still effective after one day of aging. The most durable chemicals, parathion and dieldrin, gave 100 percent mortality through the eighth and fifth day, respectively, at a concentration of 12.5 p.p.m.

In comparative tests, both pyrophyllite alone and the combination of pyrophyllite and Frianite were very toxic. Gypsum and Dilroc alone and in combination with Frianite showed little toxicity to lice. At low concentrations of toxicants, walnut shell flour combined with the diluents that were toxic to lice caused a marked decrease in effectiveness of each toxicant.

In storage tests for about one year in brown glass bottles, with sixteen chemicals impregnated on gypsum, heptachlor deteriorated but the others did not.

In dust tests, with gypsum, at concentrations of 500 p.p.m. there were 12 chemicals of 13 tested which were superior to DDT. Several of these, however, were not effective at lower dilutions.

Six of the chemicals tested were outstanding as lousicides. For comparison of these with DDT the average percent mortality of lice is extracted from table II of above mentioned thesis, as follows:

| Chemical | Concentration in parts per million | | | | | |
|---|---|---|---|---|---|---|
| | 500 | 250 | 125 | 50 | 25 | 12.5 |
| Heptachlor | 100 | 100 | 100 | 100 | 97 | 38 |
| Dieldrin | 100 | 100 | 100 | 100 | 93 | 32 |
| Lindane | 100 | 100 | 100 | 100 | 91 | 23 |
| Parathion | 100 | 100 | 100 | 97 | 63 | 11 |
| Aldrin | 100 | 100 | 100 | 95 | 87 | 41 |
| Chlordane | 100 | 100 | 100 | 70 | 11 | 0.7 |
| DDT | 12 | 3 | 0 | 0 | 1 | 1 |

Several chemicals demonstrated fumigant qualities. Those that showed fumigant qualities at a concentration of 10,000 parts per million were further diluted and tested again. Six chemicals, ethyl tetradiethiopyrophosphate, aldrin, heptachlor, chlordane,

lindane and dieldrin, at a concentration of 100 p.p.m., gave kills which varied from 100 percent to 17 percent in the order named. At 50 p.p.m., the kill varied from 93 to 0 percent kill. At 25 p.p.m. none of the chemicals showed fumigant action.

From a study of the second test table it will be seen that several chemicals made into louse powders are a great deal more toxic than DDT.

For these studies the toxicity to warm blooded animals of the various chemicals tested was ignored. It is known that Parathion is certainly too hazardous to be used in any form of louse control. Many of the others may also be hazardous but the author feels that some of these may be useful should lice become resistant to DDT.

## A PREMATURE EMERGENCE OF PERIODICAL CICADA

Follow-up of a report as of June 7, 1952 that locusts were singing in the woods near Allenwood, Monmouth County, New Jersey, disclosed the presence of large swarms of the periodical cicada or seventeen-year cicada (Magicicada septendecim Linn.) in an area roughly two miles square along Route 34, near Allenwood Circle.

Brood II, due in 1955, and brood X, due in 1953, are the only broods reported from Monmouth County by William T. Davis (Circular 97, N. J. Dept. Agri., 1926) and more or less state-wide in extent. Brood VIII, due in 1951 was listed only from Essex County. It, therefore, seems probable that this appearance is a premature emergence of brood X.—WILLIAM M. BOYD.